

LIGHTSATS:

and their Attraction to Budget Oriented Federal Agencies

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The term "Lightsats" refers to low volume, low mass, low-earth orbit, satellites suitable for launching from Get Away Special (GAS) canisters, or as secondary payloads on expendable launch vehicles. I am aware of only a few recent lightsats including NUSAT I, GLOMR and a number of amateur radio satellites. I know of no civilian federal agency presently operating a lightsat, or with any immediate plans to do so. Yet when Larry Thomas asked for a speaker from the Federal Aviation Administration (FAA) to discuss the GAS program, and particularly its potential for launching lightsats, from the FAA's perspective, I naively agreed to find one. So I started studying the Federal Aviation Administration Plan for Research, Engineering and Development, and talking to people responsible for implementation of this plan. This plan is the official document describing the activities designed to improve the safety, capacity and efficiency of the National Airspace System (NAS) between now and the year 2015, by exploiting existing capabilities and introducing specific new technologies, including satellite-based services. I found very little has been done concerning incorporating specific satellite-based services into the NAS with the exception of the GPS navigation system. And this is to be expected since, until recently, there was little general awareness of the technical and economic potential of lightsats. Consequently, I am not here to present an official view of the FAA concerning utilization of lightsat technology, since that has not been defined yet. However, it has been my experience that the FAA will be very interested in, and supportive of, any new or existing technology that offers potential to improve the safety, capacity and efficiency of the NAS. This morning I intend to tell you what I have learned can be done from the perspective of an individual within a government agency who wants to use a new technology to enhance the mission of that agency. I hope what I learned and will pass on to you will be an inspiration to any government employees in the audience and useful to those of you who are seeking government sponsorship.

For those of you who do not represent government agencies, I believe there are several advantages to gaining the sponsorship of government agencies for your projects. These include:

- Mission Support:

You can usually find an agency whose mission practically requires it to support your project if properly presented. It is their responsibility and assigned task.

- Contacts:

In the course of their work many people in an agency get to know the knowledgeable and influential people in a particular field. Frequently they have come out of the particular industry the agency is concerned with and are members of the associated professional institutions.

- Money:

Although an agency may not have much available money, it is sometimes easier to justify an expenditure for public benefit, education, research, etc., than it would be in a profit driven environment.

- Insurance:

Since the government is self insured, if they become the owner/operator of a satellite the expensive liability insurance premiums can be avoided.

For those among you who do represent government agencies I would like to point out the benefits received by the FAA from the NUSAT I project.

NUSAT I was designed, built, launched and operated for about twenty months with a total direct expenditure by the FAA of less than \$70,000. Of course, there has been a great deal more in unidentified FAA employee time, vehicle use, travel, etc. But I doubt the total was more than \$150,000. Not only did NUSAT I provide the FAA with the experimental data needed to build a future operational system, but it also demonstrated to the FAA that a small, low earth orbit satellite could be used for other applications important to its mission. Representatives of the Center for AeroSpace Technology (CAST) at Weber State College, the organization that evolved out of the NUSAT I project, are meeting with FAA officials this week to explore the use of these satellites in Research, Engineering and Development projects for several FAA programs. The FAA is now open to suggestions for using the low earth orbit satellite for missions not even considered before.

The public relations and aviation education aspects of this program were exploited fully. The NUSAT I project is frequently held up within the FAA as an example of what Aviation Education Facilitators can accomplish. Models and audiovisuals of NUSAT I, with explanations of its purpose, have been displayed at many schools in northern Utah, at various NASA and FAA facilities, at the Utah State Capital, at many fairs and conventions, at the Smithsonian Institution and in the facilities and magazines of many corporations.

Local FAA personnel have learned how to develop synergistic relationships with educational institutions. The FAA has completed three other contracts with Weber State College totalling \$4,300 and is presently negotiating at least two more for about \$5,000. Although the amounts of money are small, the benefits to the FAA in work accomplished which would not otherwise get done and the benefits to students in practical experience and exposure to real problem solution are out of proportion to the expenditures.

Perhaps the greatest benefit to the FAA has been an expansion of our vision. We have learned that traditional program management may not be the best way to accomplish every task. We have learned to trust our associates to try creative ways of accomplishing our assigned mission. We have glimpsed the future and our role in it.

Based upon our experience with the NUSAT I and more recent projects, I would suggest that to work successfully with a government agency you will need to keep several common sense principles in mind:

1. Advocates:

In my opinion it is absolutely mandatory that you have an advocate within the sponsoring agency who has the influence and authority to accomplish what you wish to do or can gain the support of such a person. In fact, more than one advocate, at several different levels of the organization is even better.

NUSAT I received support from the FAA not only because a number of local FAA employees dedicated a great deal of time and effort to the project, but because the Regional Director sought and approved FAA support at regional and national levels. In addition, FAA Administrators visited the college and provided top level coordination with NASA officials at key moments in the project.

2. Care and nurture of your advocates:

You must recognize the constraints under which your advocate operates including budget cycles, conflict of interest regulations, personal influence and creativity, professional/technical skills, personal time and dedication, legal/regulatory constraints concerning contracting, etc. Please be understanding and patient, your advocate may be risking his reputation and future effectiveness and promotions on your project.

It is probably futile to say this, but when representatives of your organization make public statements about your project try to make sure they are accurate and not embarrassing to your sponsor. Regulatory agencies take enough heat over true statements. Statements about NUSAT I included such erroneous information as: airports would be shut down for several days without its services, air travel would be much safer when it became fully operational, it is still in use, etc.

3. Relevance to the agency mission:

Your proposed project must directly support the mission of the agency whose support you are seeking. The first reason is simply that agency resources can not be used legally if the project does not support its mission. Secondly, individuals within an agency are likely to be technical experts, and know other technical experts and authorities, in the specialities involved.

The NUSAT I project fitted quite nicely into several niches of the FAA mission. It provided experience in the use of a new technology to solve a technical problem in the NAS. It provided an excellent vehicle for aerospace education which is one of the purposes of the FAA. It enhanced the public awareness of the role of the FAA, which is always important to a regulatory agency. Like all regulatory agencies, the FAA particularly appreciates the rare publicity that is complimentary to it. The FAA enjoyed publicity to the effect that it was applying space age technology to the practical solution of air traffic

control problems at virtually no cost. Although the reports were rarely accurate they were always laudatory.

4. NASA support:

It goes almost without saying that you will need the support and advocacy of the NASA people. Fortunately, it is not very difficult to get their support.

I will not try to list all the people within NASA who made the NUSAT I project a success. Without the complete support of the people here at Goddard, at the Cape, in Houston, at Headquarters, the astronaut corps, etc. NUSAT I would not have flown. I would like to point out that much of their support was above and beyond the call of duty, and not without considerable personal risk.

5. Support of non-government groups:

It is important to enlist the support of related non-government groups such as professional and trade organizations (IEEE/AIAA/SAE/etc.), amateur radio groups, manufacturing or operating corporations, etc. These groups provide influential support, as well as, personnel, material and financial resources. Just as with the government agency involved, you should seek an advocate within each of these other organizations.

As you all know, the NUSAT I project was almost totally supported by such organizations. Key people in these organizations sometimes made things happen, and at other times, let things happen. In addition, the very fact of their public support created more support within the FAA. A few local engineers proposing a lightsat may well be considered crackpots by their superiors, but when officials of major aerospace companies start to offer support and people see a project will succeed, the agency support is assured. Parenthetically, this type of support also helps an agency in its relationships with elected officials.

6. Demonstrate broad interest and support:

It is important to demonstrate the interest in, and support of, a proposed project by other organizations who may benefit from it.

The NUSAT I project enjoyed the interest and support of Western Airlines, the United States Air Force, the Utah Air National Guard, the British Civil Aviation Authority, the British Defense Ministry and the International Civil Aviation Organization.

7. Educational institutions:

Educational institutions are good places to organize projects in order to find both creative people and cheap labor... In addition, educational institutions are relatively neutral places where government agencies and competing companies can work together.

Although NUSAT I generally has become associated publicly with Weber State College, it is as much a product of Utah State University. In addition, some very key antenna design, construction and testing was done at New Mexico State University. It is a product of many individuals within these institutions and others who were attracted to the project through these institutions. Although many corporations contributed to the NUSAT I project, it would have

been impractical, and in many cases, illegal, for FAA officials to seek these contributions. But we all could work to support a project at an educational institution with no real nor apparent conflict of interest. Partly as a result of this project several new corporate ventures have started which should benefit the local economy, and this is one important function of state funded educational institutions. Another benefit was the successful matching of recruiting companies with the best of the job seeking students.

8. Money:

Do not expect to get vast amounts of public money. Even though an agency may have billion dollar budgets for payrolls, property management, etc. your sponsors may have very little discretionary money for experimental or demonstration projects.

9. Leadership:

You must have the leadership of dynamic, enthusiastic, individuals with the vision, dedication and motivational skills to get a project started and keep it going.

Many of you know the story of NUSAT I. A NASA official advised me to get in touch with Gil Moore. I was a naive young man and made the mistake of spending ten unchaperoned minutes with Gil. Many fellow victims are in this room today and recognize my Faustian plight. Gil told us we could do it, that it was our moral duty to our country, to our families, to our own happiness, to unborn generations of students, etc., etc., etc. And besides that, he offered one of the GAS cans he had purchased and his full support. Gil jokingly tells new participants in his projects that you have surrendered your soul to the enterprise.... he's not joking.

Perhaps Gil's greatest achievement has been that he has cloned himself in the person of Bob Twiggs. Bob now leads, guides, cajoles, threatens, encourages, commits, supports, etc. the Center for AeroSpace Technology at Weber State College in much the same way Gil did during the NUSAT I project.

I believe the opportunities to find government sponsors and advocates are almost limitless. Many of you were at the DARPA/AIAA sponsored conference on LightSats at the Naval Post-Graduate School in Monterey, CA, last August and at the Conference on Small Satellites sponsored by Utah State University and the AIAA in Logan, Utah, earlier this month. You may have been as surprised as we were at the tremendous range of interest and potential applications of small low earth orbit satellites. The government was represented by every branch of the Department of Defense, the Department of Transportation, the Federal Communications Commission, the Department of Energy, the National Aeronautics and Space Administration and probably some more we didn't meet.

Several people in the FAA are now interested in using small, low earth orbit satellites to implement some of the programs identified in the Research, Engineering and Development Plan. These include: providing accurate, current, over ocean aircraft positions to air traffic controllers; enhancing low altitude and off-shore communications capabilities; monitoring and controlling remote facilities; and dependent surveillance systems.

Similar systems are of interest to other government organizations. We know the Federal Communications Commission is interested in the solution of a problem common to the FAA and several military groups. We know that many other government organizations maintain remote communications and sensor facilities that require monitoring and control including: the Department of Defense, the Bureau of Land Management, the Department of Energy, the National Park Service, the National Oceanic and Atmospheric Administration, the United States Coast Guard, the National Forest Service, the National Weather Service, the Secret Service, the Drug Enforcement Administration, the Immigration and Naturalization Service, the Department of Agriculture, the Federal Bureau of Investigation, the Department of Transportation, the United States Fish and Wildlife Service, the United States Geological Survey, etc. These are just a few I have worked with from time to time and now have remote facilities and communications requirements.

I'm sure that many of you know of applications and experiments or demonstrations of great interest to these, and other, agencies. In addition, international, state and local governments have many agencies which parallel the Federal agencies. Utilities, oil companies, railroads, shipping companies, engineering companies, etc. and associations of these companies offer opportunities similar to government agencies.

In conclusion, I hope I have convinced you there are many advantages to be realized from government sponsorship of GAS projects, both to the sponsor and the sponsored. I hope I have given you some useful insight on how to win friends and influence people among your public servants. And I hope I have inspired some of you to seek new applications of the GAS resource which will benefit us all.

I appreciate the opportunity our hosts have given me to address you and your kind attention. Thank you.